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Abstract

PHYSICAL START-UP OF THE REACTOR AT THE BELOYARSK ATOMIC POWER STATION NAMED AFTER I.V.KURCHATOV

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The paper describes the results of the experiments which were carried out to study the physical characteristics of the reactor at the Beloyarsk atomic power station named after I.V.Kurchatov. The physical start-up of the reactor was carried out is September-December of 1963. The first criticality was achieved on September 3,1963.

At the beginning of the experiments several critical assemblies with a uniformly enriched uranium lattice were assembled and studied in the graphite stacking or the reactor; a study was also made of assemblies with a non-uniform lattice formed by the fuel elements of two types differing in the degree of uranium enrichment.

The study of each assembly included the measurement of the neutron flux distribution along the radius and height of the reactor and determination of the reactivity effect from the fuel channels, from the channels of the safety and control rods and from other disturbances.

Resonance absorption in uranium-238 was measured with the help of experimental channels specially made for the purpose.

After the assemblies had been studied with a minimum critical mass the reactor was fully loaded by the fuel channels. With the operating charge of the reactor a study was made of the effect produced on the reactivity by the water in the fuel channels.

These experiments have confirmed that the reactivity changes but little when water is blown away from the fuel channels, which is especially important for stable performance of the reactor at

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the beginning of power operation when the density of the coolant sharply changes.

When making investigations with the operating charge considerable attention was devoted to the study of the neutron flux distribution within the reactor and the dependence of this distribution on various positions of the absorbing rods in the reactivity compensation system.

The reactivity margin, the intensity of the temperature effect and of the poisoning effect were determined by the changes in the physical "weight" of the absorbing rods.

Reactor monitoring during the physical start-up as well as the experimental work were carried out with the help of special highly sensitive instruments (neutron flux indicators, reactivity meters, harmonic master analyser for the measurement of the neutron flux distribution and of the weights of the absorbing rods by their oscillation). Some of these instruments will be used for the investigation of the transiensts in the reactor and for determining its frequency characteristics.

The experiments and calculations carried out during the physical start-up have made it possible to establish the main physical characteristics of the reactor and to suggest important recommendations in respect to the operational control of the reactor.